The Newsletter of the National Weather Service in Green Bay, Wisconsin

www.crh.noaa.gov/grb

Packerland Weather News

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Inside this issue:

2002 Tornado Season Goes Into the Record Books

By Phil Kurimski, Forecaster, and Jeff Last, Warning Coordination Meteorologist, NWS Green Bay

The 2002 severe weather season can be summed up in one phrase: "Early, often, and near-record breaking." The season began with several tornadoes on April 18, and ended with another tornado event on September 30. In all, 15 tornadoes were confirmed in the NWS Green Bay forecast area of north-central and northeast Wisconsin. The number of tornadoes in 2002 was only one shy of the record of 16, set in 1970. Other notable severe weather events in 2002 occurred on July 30 and Labor Day.

Thunderstorms developed ahead of a strong cold front during the late afternoon and evening hours on April 18. The storms produced large hail, strong winds, and five tornadoes as they moved across NWS Green Bay's forecast area. The strongest tornado, an F1, occurred a few miles east of Stratford in Marathon county. As the storms moved east, they developed into a line of thunderstorms with hail and wind damage. This event kept the Green Bay office busy, as 39 weather warnings were issued, the most ever issued so early in the season.

July 30 was a relatively pleasant, cloud-free day, providing one of the key ingredients for severe weather as temperatures rose to around 90 degrees. This led to an extremely unstable atmosphere, allowing afternoon thunderstorms to develop into supercells. Three tornadoes occurred in the NWS Green Bay forecast area, all rated F0. Even though the severe storms produced tornadoes, the evening will be remembered for the straight-line wind damage that caused trees to fall onto Boy Scouts camping in Waushara county, resulting in the death of one scout.

Damage to a house near Wausau after the Labor Day twister.

Labor Day will be remembered for the strong tornado that struck Ladysmith, Wisconsin. A cold front moving into the state from the west was responsible for triggering

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How Are We Doing?

If you have any suggestions for articles or have comments about the ***Packerland Weather News***, feel free to contact us at:

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NOAA Weather Radio Network Expands in State

By Jeff Last, Warning Coordination Meteorologist, NWS Green Bay

Last year will not only be remembered for all of the severe weather across northeast and north-central Wisconsin, but also for the largest NOAA Weather Radio expansion in the state since the initial network was installed in the 1970s. As part of a congressional "earmark" in 2002, six new weather radio stations were installed in Wisconsin by the National Weather Service, half of them in the NWS Green Bay forecast area.

Three new NOAA Weather Radio transmitters were installed in northeast Wisconsin, and a fourth was moved from the NWS La Crosse forecast area to Waushara county in the NWS Green Bay area. Rhinelander, New London, and Wausaukee became homes to new 1000 watt weather radio transmitters. Each transmitter broadcasts weather information tailored to the specific area, directly from the NWS Green Bay Weather Forecast Office. As part of the 2002 weather radio project, transmitters were also installed near Ladysmith, Wisconsin Dells, and Black River Falls.

Ken Kortenhof, Oneida County Emergency Manager, speaks to the media during the dedication ceremony of a new weather radio transmitter near Rhinelander.

The state-owned weather radio transmitter that was initially installed at Friendship (Adams county) in 1994, was moved in September 2002 to Coloma in western Waushara county. The addition of the four weather radio stations to the NWS Green Bay forecast area increased radio coverage across northeast and north-central Wisconsin to nearly 100% of the population.

"[Last year] was the largest NOAA Weather Radio expansion... since the 1970s."

On the Web

www.crh.noaa.gov/grb/nwr.html

Severe Storms of 2002

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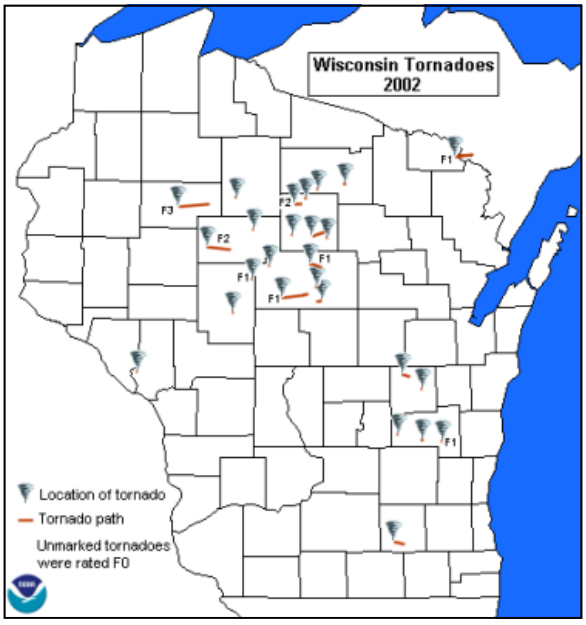
this storm. The storm that struck Ladysmith eventually produced two tornadoes over Marathon County, the strongest being an F1 just north of Wausau. The twister was on the ground for at least five miles as it flattened two barns, heavily damaged six homes, and did minor damage to 25 others. Other storms that evening produced damaging winds and large hail.

The busy tornado season ended with the strongest twister of the season in northeast Wisconsin. An F2 tornado touched down several miles west of Tomahawk in Lincoln county. It was only on the ground for five minutes, but caused significant damage to trees and a house in the path of the storm. Another tornado hit the town of Aurora in Florence county 20 minutes earlier.



Two Rivers Observer Receives 50 Year Award

By Al LaGree, Data Acquisition Program Manager, NWS Green Bay

The Cooperative Observer station for the city of Two Rivers, located at the City Filtration Plant, received a 50 year length of Service Award September 24, 2002.

The Two Rivers Plant began taking weather observations in September 1952. Each day, at 7:00 am, plant workers gather the high and low temperatures and precipitation from the previous 24 hours and record it. The data is sent to NWS Green Bay, and then forwarded to the National Climatic Data Center (NCDC) in Asheville, North Carolina, where the records are permanently kept.

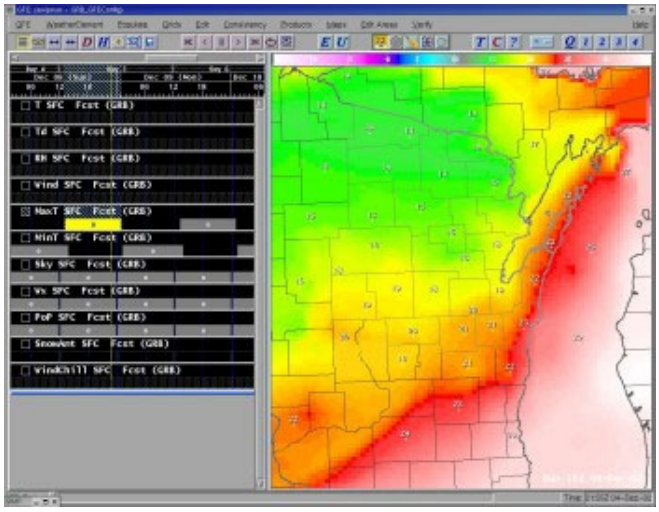
The Two Rivers plant employees are a few of over 11,000 dedicated volunteers that record daily weather related information that forms the backbone of our nation's climatological data collection network. Normals, means, and extremes for temperature and precipitation in the local area, and in some cases river stages, are often computed directly from the information gathered by cooperative observers. These data are used in a variety of ways, including architecture, agriculture, commerce, engineering, aviation, industry, and litigation.

A New Era in Forecast Preparation

By Phil Kurimski, Forecaster, NWS Green Bay

Until recently, NWS forecasts for the public were formulated in a meteorologist's head from weather analysis, numerical forecast model data, and pattern recognition, then transferred to paper in the form of the Zone Forecast Product (ZFP). Specific details of the forecast, such as effects from Lake Michigan, were written out. For example, wording such as "Highs in the middle 70s inland with upper 60s near the lake" might be used to describe a lake breeze. Zone groups were split up by county, and time intervals were typically 12 hours long. The ZFP was often written after the forecaster had prepared the scenario for the next few days in his or her head; translating this into word form was often one of the last tasks performed in the forecast process.

Enter the "digital data" era and the use of the Interactive Forecast Preparation System (IFPS). The forecaster still formulates a forecast by using their meteorological experience and model output. However, rather than writing a forecast and using text to interpret the weather, a meteorological database, consisting of gridded blocks of sensible weather, is graphically edited. The ZFP is now a by-product of the gridded database. Three-hourly graphical forecasts are another by-product of this digital database. Now the customer can see how far, and at what time, a lake breeze will move inland, enhancing their decision-making process.



The IFPS Graphical Forecast Editor (GFE) allows forecasters to edit the gridded database by weather element and time.

Graphical forecasts, and other products from the gridded database are available online at: www.crh.noaa.gov/grb/ifps

On the Web

www.crh.noaa.gov/grb/ifps

WFO Green Bay Participates in Career Expo '02

By Linda Karman, Administrative Support Assistant, NWS Green Bay

The National Weather Service office in Green Bay once again participated in the Partners in Education Career Expo. Held November 12, Career Expo '02 offered high school sophomores in the greater Green Bay area the opportunity to visit with representatives from private and public organizations to learn more about a wide variety of careers. Representing the NWS were meteorologist Roy Eckberg, hydrometeorological technician Dan Clark, and administrative support assistant Linda Karman.

Linda Karman speaks to students at Career Expo '02.

Students were given the opportunity to interview company representatives, thus gathering valuable information on job duties and educational skills required of a position. Eckberg, Clark, and Karman were able to discuss the three careers available at an NWS field office–meteorology, electronics, and administration. Over 100 sophomores visited with the NWS representatives throughout the day. Several students showed great interest in a career with the National Weather Service.

NWS StormReady Program Saves Lives

Americans live in the most severe weather-prone country on Earth. Each year, Americans cope with an average of 10,000 thunderstorms, 2500 floods, 1000 tornadoes, as well as an average of six deadly hurricanes. Potentially deadly weather impacts every American. Communities across the country and here in Wisconsin can now rely on the National Weather Service's StormReady program to help them guard against the ravages of Mother Nature.

About 90% of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. StormReady, a program started in 1999, helps arm communities with the communication and safety skills needed to save lives and property–before and during the event.

This was most evident on November 10, 2002, when severe thunderstorms and tornadoes roared through Van Wert County, Ohio.

To earn a January 2002 NWS StormReady designation, Van Wert County placed a series of warning alert systems in public locations, including a movie theater destroyed in the November 10 storm outbreak. Quick action by Van Wert Cinemas manager Scott Shaffer and his staff got more than 50 adults and children out of theaters in the multiplex and into safer conditions in a hallway and restrooms. Minutes later a tornado tore off the building's roof and tossed cars into the screen and front seats, where moments earlier kids and parents had been watching "The Santa Clause 2."

StormReady communities are better prepared to save lives from the onslaught of severe weather through better planning, education, and awareness. No community is storm proof, but StormReady can help communities save lives. For more information on the StormReady program in north-central and northeast Wisconsin, contact Jeff Last, Warning Coordination Meteorologist, at the NWS Green Bay office.

On the Web

www.stormready.noaa.gov

Winter '02-'03 Update: El Niño Pattern Established

By Roy Eckberg, Forecaster, NWS Green Bay,
With information from the
NOAA National Climatic Data Center

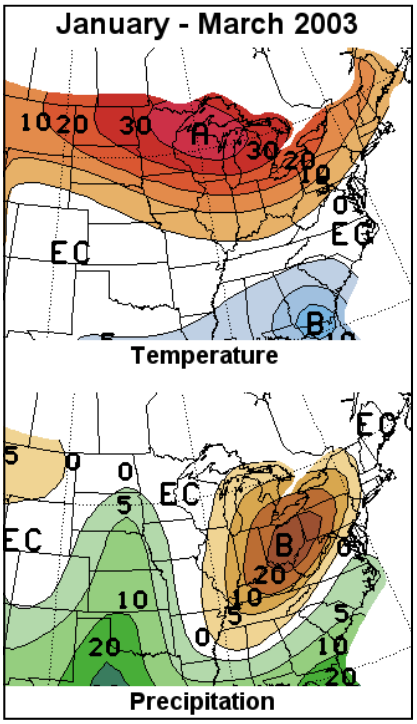
What is El Niño?

Every year around Christmas time as the winds subside in the tropics, the temperature of the Pacific Ocean waters along the coast of Ecuador and Peru increases. This warming is part of the natural annual variation in the oceanic circulation, although the degree and extent of the warming varies from year to year. The name El Niño, Spanish for The Male Child, was given to this warming by Peruvian fishermen. As the water temperature increased, the fish departed for colder waters and the fishermen used that time to repair their boats and nets.

El Niño was originally used only to describe the warm current that developed along the coast at Christmas time. The term is now commonly used to refer to persistent, large-scale warm events in the central Pacific. Significant changes in the circulation of the atmosphere are associated with the changes in sea surface temperature. As a result, unusual weather is often experienced throughout the Tropics, such as droughts in Indonesia and Hawaii, floods in Ecuador, and hurricanes in Tahiti. Large weather anomalies may occur beyond the Tropics as well, especially in the hemisphere experiencing winter.

The term "Southern Oscillation" is the name given to the associated atmospheric fluctuations. The term is used to refer to the self-sustained oscillation of the combined ocean-atmosphere system in the central Pacific. The acronym ENSO (El Niño/ Southern Oscillation) was first used to differentiate the large-scale warm events from those confined to coastal South America. ENSO is now frequently used to identify the coupled ocean-atmosphere system in the tropical Pacific. ENSO has been called the single most important influence on extreme climate events in many regions of the global tropics. The four most important parameters that contribute to the El Niño / Southern Oscillation phenomenon are the sea surface temperature, the thermal structure of the ocean, the atmospheric winds, and the tropical rainfall.

The precursors of an El Niño can sometimes be detected months in advance of its onset. Because El Niño lasts for such a long time, the knowledge that an El Niño is occurring or will soon occur can be used by those who make long-range (monthly and seasonal) outlooks of the weather across the U.S. During El Niño winters, on average, it is warmer than normal in the northern great Plains, New England and the Pacific Northwest, and colder than normal along the Gulf Coast. However, there are large variations among the years when an El Niño is in progress. Weather and climate anomalies always occur, and for many different reasons. El Niño is only one factor that may contribute to the weather of any particular season, especially the winter season across Wisconsin.



Late winter outlook for temperature and precipitation from the NWS Climate Prediction Center. A=Above normal; B=Below normal; EC=Equal chances.

El Niño and Our Weather

During past El Niño years, there has been a definite impact on the weather across the upper Midwest, including Wisconsin. Looking at Green Bay records, El Niño winters (December through February) have shown a very strong trend toward above normal temperatures and below normal snowfall. So far this winter, December 2002 averaged about 5 degrees (F) above normal. Snowfall for the month was substantially below normal, with many locations experiencing a "brown" Christmas for the first time in years.

With history on its side, the NWS Climate Prediction Center (CPC) continues to forecast warmer than average temperatures into early spring. The greatest chance for above normal temperatures will occur across the Upper Midwest, including much of Wisconsin. There are equal chances for above, below, or normal precipitation over western Wisconsin, while in the east, precipitation may trend toward below normal values.

On the Web

www.cpc.noaa.gov

NWS Lands at 2002 EAA AirVenture and KidVenture

By Rich Mamrosh, Senior Forecaster,
NWS Green Bay

The NWS Green Bay office has been participating at the EAA AirVenture in Oshkosh for nearly ten years. In 2002, a booth in the Federal Pavilion was staffed by personnel from the NWS Aviation Weather Center and NWS headquarters, with assistance from the forecast offices at Green Bay and Milwaukee/Sullivan. Live radar and weather map displays were used to show pilots where to obtain aviation weather information on the Internet, and how to best use it. In addition, weather questions were answered and brochures distributed to tens of thousands of visitors to the booth.

Rich Mamrosh talks with a future meteorologist at KidVenture.

In addition to the booth at the Federal Pavilion, NWS Green Bay actively participated at KidVenture, held concurrently with AirVenture. KidVenture is an outreach effort of the EAA which encourages young people to take an interest in aviation, math, and science. The NWS booth at KidVenture 2002 featured a weather balloon, instrument shelter, barometers, weather radios, rain gauges, and wind equipment. Kids really enjoyed touching the eight foot diameter weather balloon, spinning the cups on the anemometer, and pouring water in the rain gauge to see how it works. Adults also appreciated the opportunity to ask weather questions and pick up weather safety and information brochures.

Mike Szkil, NWS Headquarters, answers questions at the NWS booth in the Federal Pavilion.

Visitors from nearly every state and many countries visit the NWS booths at EAA each year. Why don't you plan to see us at the EAA AirVenture this summer in Oshkosh? AirVenture 2003 (July 29-August 4) promises to be the biggest one ever, as they celebrate 100 years of powered flight.

Summer of 2002 Warmer and Wetter than Normal

By Roy Eckberg, Forecaster,
NWS Green Bay

After a very cold spring across central and northeast Wisconsin, the first day of June brought summer-like warmth to the area. Highs reached 90 F at Green Bay, 86 F at Wausau, and 81 F in Rhinelander. For the month, most locations experienced warmer than normal conditions. This trend continued through July as temperature departures for the month were generally 2 to 3.5 degrees F above normal. The warmest day of the year occurred on July 21st. Green Bay reached 96 F, Appleton 99 F (airport), Wausau 95 F, and Rhinelander 92 F. Cooperative observers at Waupaca (101 F) and Shawano (100 F) were the only places to crack the century mark. The month of August ended up cooler than average. Overall, the summer of 2002 will go down in the record books as a warm one.

The summer of 2002 was also wetter than normal, especially over the central part of the state, thanks, in part, to the very heavy rainfall that occurred on June 21-22. National Weather Service Doppler radar estimated over a foot of rain in a 24 hour period across portions of southwest Marathon county and western Waushara county. The city of Wautoma experienced widespread flooding, with damage estimated in the millions of dollars. The highest rainfall amount for the month of June was at Hancock (Waushara county) with 16.54 inches.

November Lake Effect Snow Hits Eastern Wisconsin

By Gene Brusky, Science and Training Meteorologist, and Phil Kurimski, Forecaster
NWS Green Bay

Introduction

During the late afternoon and evening of November 26, 2002, a lake effect snow (LES) event unfolded over eastern Manitowoc county. The heavy snowfall was localized, as the LES convection did not penetrate very far inland. Between 3:00 pm and 11:30 pm, up to eight inches of snow fell

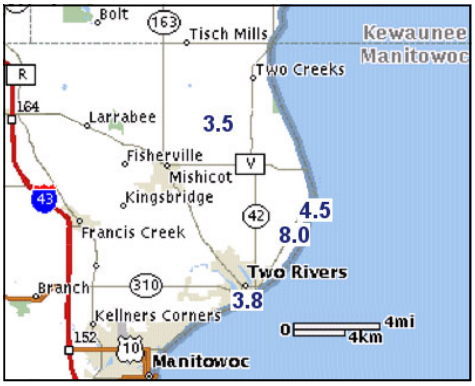


Fig. 1. Storm total snowfall map for the Two Rivers Area. Amounts in inches.

over a very small geographic area generally along and east of Highway 42, from about Two Creeks to Two Rivers in eastern Manitowoc county (Fig. 1). Although very localized in nature, this event has been, thus far this winter, the heaviest snowfall to affect eastern Wisconsin.

Synoptic Situation

A large-scale upper trough was situated over the Western Great Lakes with an embedded shortwave disturbance forecast to sweep across eastern Wisconsin during the evening of November 26 (Fig. 2). Synoptic-scale upward motion ahead of the shortwave trough helped to enhance the LES convection through the early evening hours. At the surface, high pressure building south from Canada, in combination with low pressure stretching from Kansas to eastern Tennessee, set up a northeasterly low-level wind flow over Lake Michigan by 12Z (6:00 am) November 26 (Fig. 3). The relatively long wind fetch over Lake Michigan led to considerable vertical moisture transport into the lowest few thousand feet of the atmosphere, which helped destabilize the atmosphere and organize the convection. The favorable wind fetch was forecast to persist throughout the day and into the evening, until winds backed to the northwest with the passage of the shortwave disturbance late on the 26th.

Radar Evolution of the LES

Very early on November 26, LES convection quickly organized over north-central Lake Michigan. The 0821Z (2:21 am) NWS Green Bay (KGRB) radar image revealed a couple of rather interesting features (Fig. 4). First, note the narrow band of strong convection orientated almost north-south off the Door-Kewaunee county shoreline. This convection appeared to be associated with the land breeze convergence boundary (note the northwest surface winds over eastern Wisconsin). Given the necessary temperature conditions, the western side of Lake Michigan is a favored location for the development of strong land breeze convergence in the presence of a synoptic northeasterly boundary layer flow. Also note the area of convection west of Manistee, Michigan (circled area in Fig. 4). This appeared to be the genesis region of a lake-induced circulation that was observed to drift southwest into south-central Lake Michigan by 1230Z (6:30 am, denoted by the "X" in Fig. 5). The circulation developed within the larger scale lake-induced surface trough that extended

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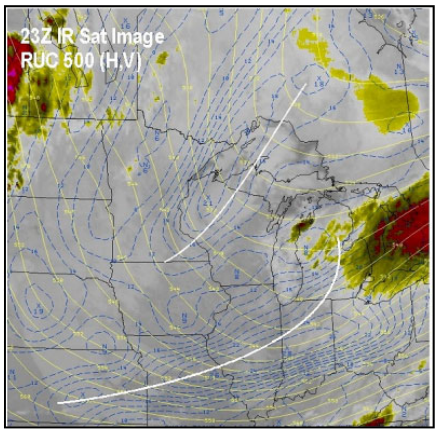

Fig. 2. 23Z infrared satellite image and RUC 500 mb height and vorticity.

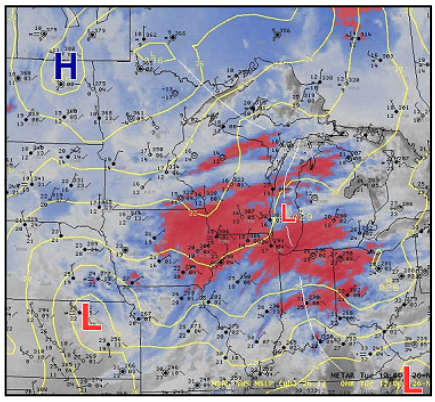

Fig. 3. 12Z infrared satellite image and surface analysis.

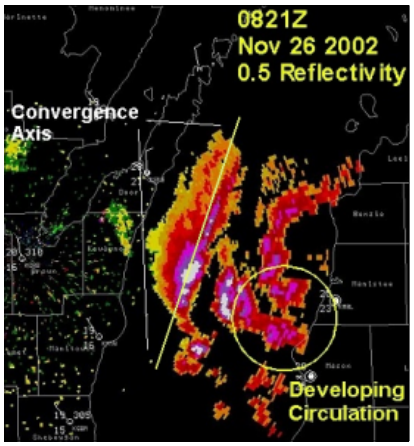

Fig. 4. KGRB 0821Z 0.5 degree base reflectivity.

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The ***Packerland Weather News***
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Lake Effect Snows

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from Lake Michigan northwest to western Lake Superior, and was likely perpetuated by the approaching upper-level disturbance evident by the enhanced clouds over eastern Iowa, northern Illinois, and southwest Wisconsin (see Fig. 3). The impressive lake snow band extending from Benzie county, Michigan, southwest to just east of Manitowoc county (Fig. 5), formed within the enhanced northeasterly boundary layer flow north of the lake-induced vortex. By mid-afternoon, the LES convection began to move onshore into northern Manitowoc county. The 2329Z (6:29 pm) radar image showed the snow band situated generally along and east of Highway 42 from Two Creeks south to Two Rivers (Fig. 6). This snow band continued to affect this region until about midnight, dumping up to eight inches of snow near Two Rivers before weakening and moving offshore by midnight.

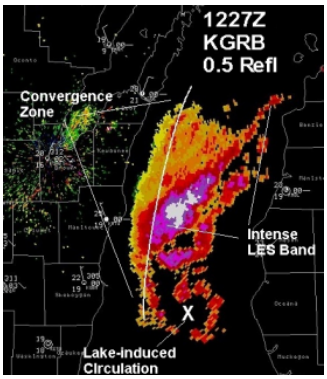

Fig. 5. KGRB 1227Z 0.5 degree base reflectivity.

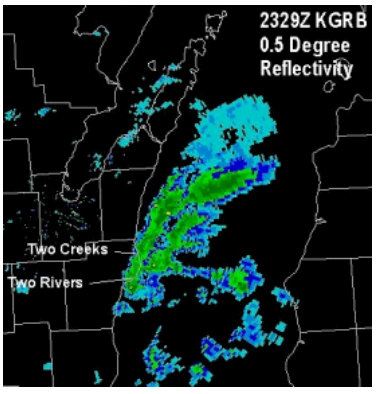

Fig. 6. KGRB 2329Z 0.5 degree base reflectivity.